Unvented Attics and SPF

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Rick Duncan
Technical Director
Spray Polyurethane Foam Alliance

Today's Presenter

Richard S. Duncan, Ph.D., P.E.
Technical Director, Spray Polyurethane Foam Alliance

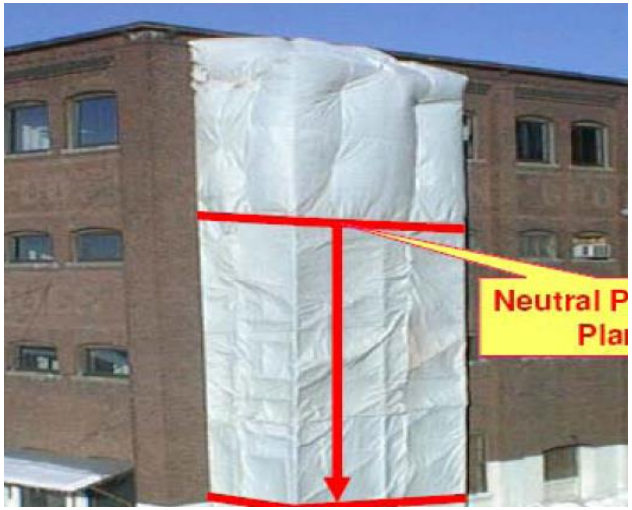
Rick is currently Technical Director for the Spray Polyurethane Foam Alliance. Prior to joining SPFA, he was the Senior Marketing Manager for Honeywell's Spray Foam Insulation business from 2006 to 2008. From 1997 to 2006, he was the Global Program Director for CertainTeed/Saint-Gobain Insulation's New Materials and Applications Portfolio. From 1989 to 1997 he was a Visiting Assistant Professor of Mechanical Engineering at Bucknell University. He holds a Ph.D. in Engineering Science and Mechanics from The Pennsylvania State University, MSME from Bucknell and a BSME from the University of Maryland. Rick is a Registered Professional Engineer in Pennsylvania and is a certified BPI Building Analyst.

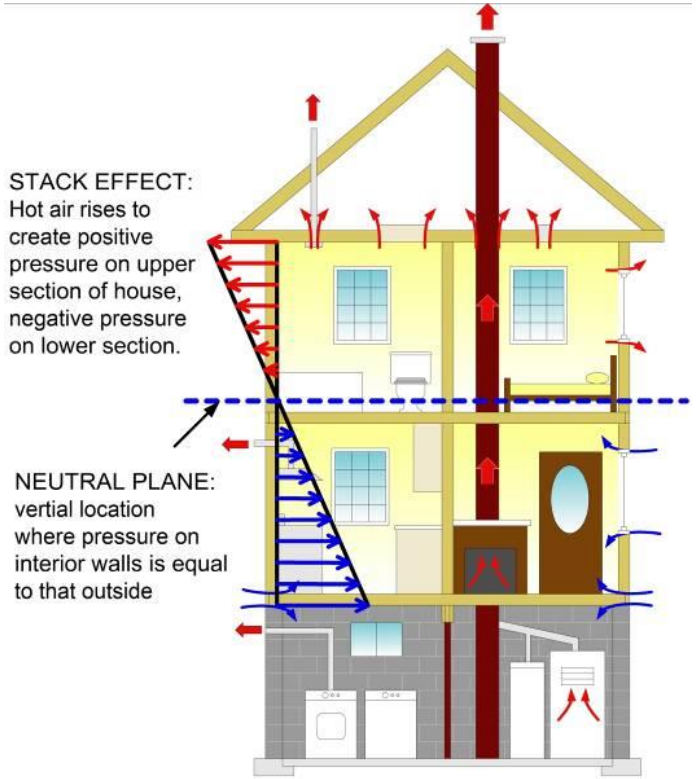
Overview

- Attics: Building Science Basics
- Spray Polyurethane Foam for Unvented Attics
- Moisture, Roof Decks and Shingles
- Fire Safety and Building Codes
- Cost and Scheduling
- Market Barriers

Attics: Building Science Basics

- Stack Effect
  - Unavoidable driver of air leakage in all buildings in all climate zones





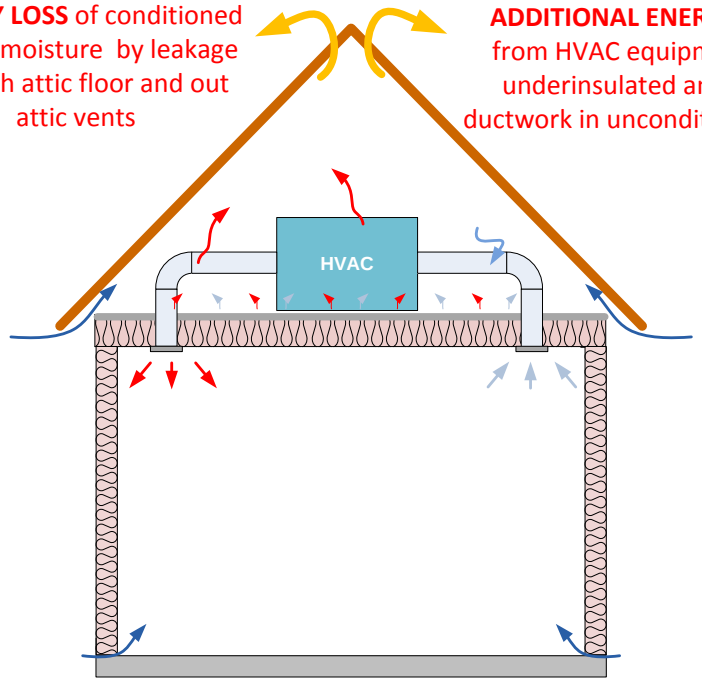
IMPORTANT: Intensity of stack effect and location of neutral plane is dependent on many factors, including exterior wind load, indoor/outdoor temperatures, HVAC system, forced ventilation and air leakage sources

Attics: Building Science Basics

- Vented Attics (heating mode)

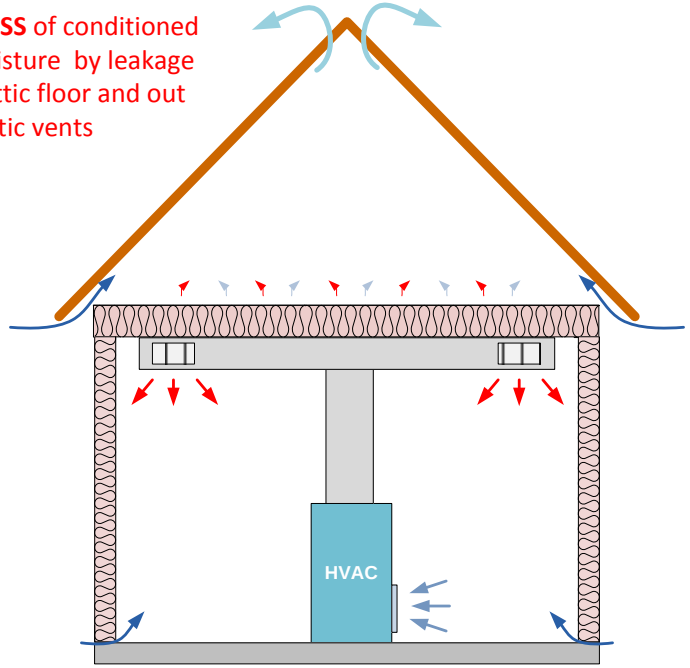
ENERGY LOSS of conditioned air and moisture by leakage through attic floor and out attic vents

ADDITIONAL ENERGY LOSS from HVAC equipment and underinsulated and leaky ductwork in unconditioned attic



With HVAC in Attic

ENERGY LOSS of conditioned air and moisture by leakage through attic floor and out attic vents



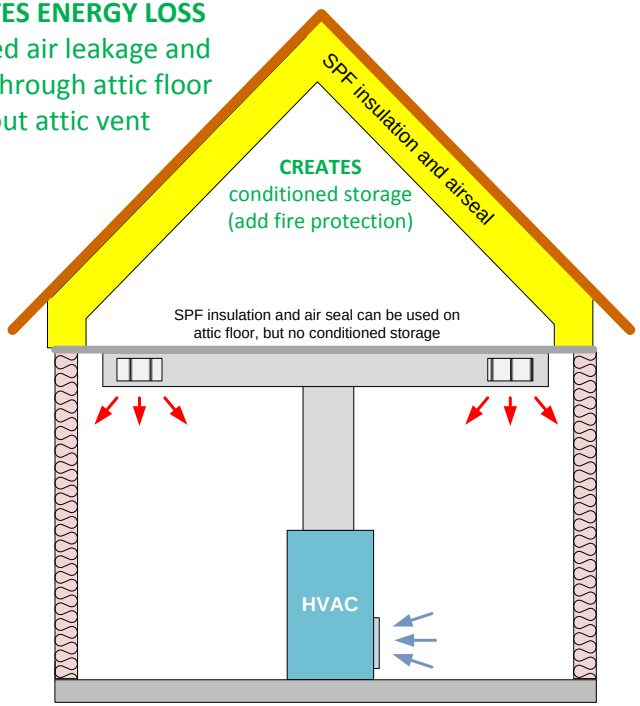
No HVAC in Attic

Attics: Building Science Basics

- **Unvented Attics** (heating mode)

Energy penalty of larger roof area vs attic floor area (not volume!) is offset by UVA savings

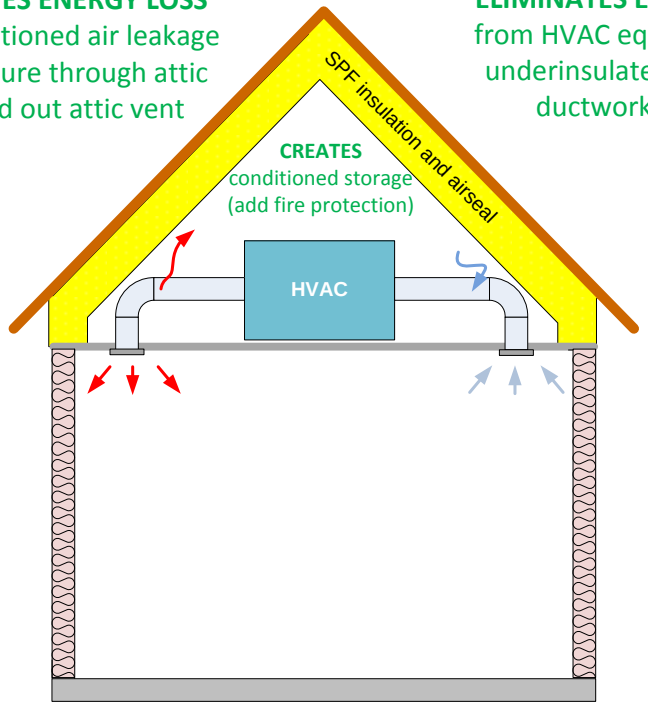
ELIMINATES ENERGY LOSS
conditioned air leakage and moisture through attic floor and out attic vent



No HVAC in Attic

ELIMINATES ENERGY LOSS
from conditioned air leakage and moisture through attic floor and out attic vent

ELIMINATES ENERGY LOSS
from HVAC equipment and underinsulated and leaky ductwork in attic



With HVAC in Attic

Attics: Building Science Basics

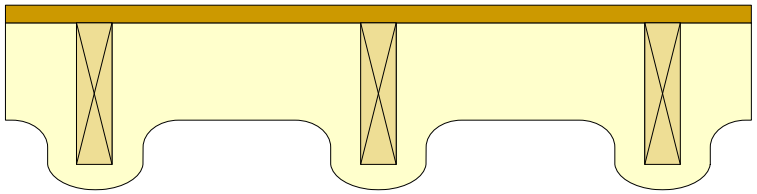
- Supported by Research
  - Building America Program (Building Science Corp)
  - Florida Solar Energy Center (D. Parker – 2005)
  - 10-20% energy savings
- Added to ICC Model Building Codes
  - Part of IRC since 2007 (Sec R806.4)
  - Permitted and used in all US climate zones
- Other benefits
  - Wildfire areas (blocks airborne embers from attic)
  - More interior space and cost savings from HVAC downsizing and equipment in attic
  - Brings sprinkler systems into condition attic

http://www.buildingscience.com/documents/reports/rr-9904-unvented-cathedralized-attics-where-we-ve-been-and-where-we-re-going

SPF for Unvented Attics

- Spray Polyurethane Foam (SPF) provides best solution for UVA
  - Consistent thermal performance over wide range of service temperatures
  - Provides integral air-sealing
  - Can provide continuous insulation installed below rafters/trusses
  - Adheres directly to substrates; no sagging or settling

Closed-cell SPF adds integral Class II vapor retarder, secondary water barrier and structural strength

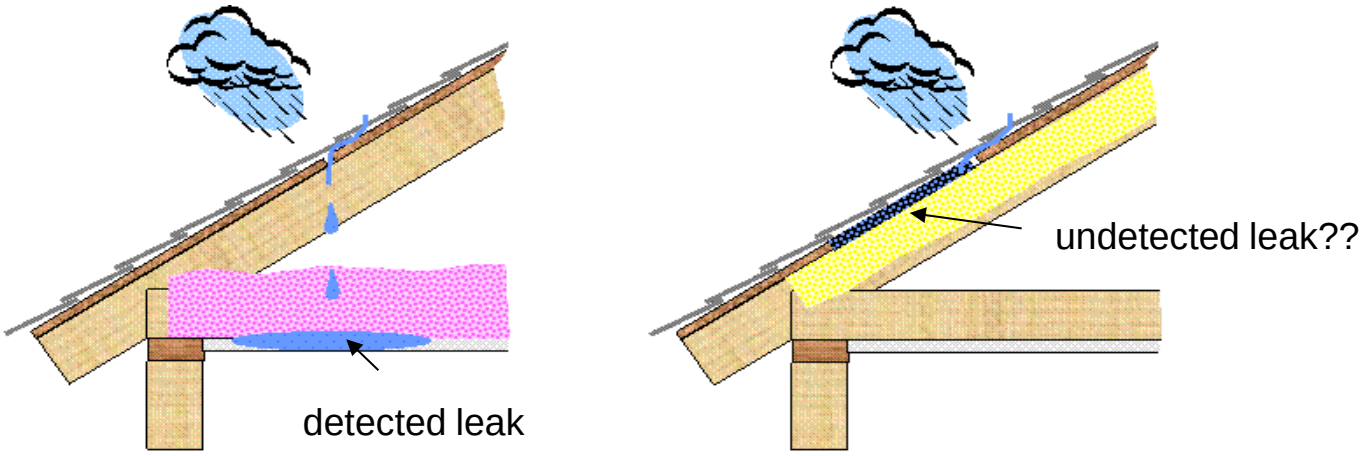


Moisture, Roof Decks and Shingles

- Vapor retarders needed in colder climates
  - Open-cell foam is moisture permeable (like fibrous insulations)
  - Interior moisture can diffuse through these insulations and condense in insulation or under roof deck in colder climates
  - Open-cell SPF needs Class II vapor retarder
  - Closed-cell SPF is a Class II vapor retarder at >2 inches

Moisture, Roof Decks and Shingles

- Water Leak Detection
  - SPF could hide water leaks in roofing system; no cases documented
  - Closed-cell and open-cell foam can behave differently
  - Vast majority of roof leaks are not in field of roof deck
  - U of FL study of closed-cell foam (soon to be published) indicates no issue



Moisture, Roof Decks and Shingles

- Asphalt Shingle Warranties
  - Service life decreased by increased surface temperatures of UVA (all insulations)
  - Elevated temperatures caused by many factors (in order)
    1. Latitude
    2. Shingle color
    3. Roof pitch and orientation
    4. Insulation applied below roof deck
  - Some asphalt shingle manufacturers have unclear warranties; others permit UVA. **Consult shingle manufacturer warranty**



Fire Safety and the Building Codes

- Foam Plastics in the Building Codes
  - Specific requirements for fire protective coatings
    - IRC Section R316 and IBC Section 2603
  - All foam separated from interior by 15-min. TB
  - Limited access attics not for storage need IB* over foam and attic separated from interior by 15-min. TB
  - Attics with easy access and/or used for storage must cover foam with a 15-minute thermal barrier

Cost and Scheduling Impact

- SPF has higher first cost
  - At the same R-value, installed cost of SPF is 3x fibrous insulation
  - Scheduling of multiple homes can cut cost
  - SPF is a growing upsell opportunity
- Minor impact on construction schedule
  - Hazardous airborne chemicals (isocyanates) during and just after spraying www.spraypolyurethane.org
  - Home must be contained and ventilated
  - No one inside spray zone (home) without proper PPE until following day. ***Use of respirators require fit testing and medical evaluation per OSHA*

Market Barriers

- Questions and Concerns with SPF for UVA
  - ✓ Energy penalty of additional conditioned volume (actually area)
  - ✓ Moisture management
  - ✓ Water Leak detection
  - ✓ Asphalt shingle warranties
  - ✓ Attic/roof deck ventilation requirements
  - ✓ First cost
  - ✓ Building Evacuation and Scheduling
  - Odors and IAQ questions
  - Foam shrinkage and thermal expansion of structure
  - Sealing hot combustion appliance vents
  - cPVC sprinkler systems (not an actual issue)

For More Information…

- SPFA Professional Certification Program
- SPFA Website and Annual Conference
- Formulators and Systems House Suppliers

SPRAYFOAM 2015
January 26-29, 2015
Albuquerque, NM

SPFA Website:
www.sprayfoam.org